

Larval development of the Red Swimming Crab, *Bathynectes longipes* (Risso, 1816) (Crustacea: Decapoda: Portunidae)

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Introduction

The Red Swimming Crab, *Bathynectes longipes* (Risso), has been reported from southwestern regions of the British Isles (Ingle, 1980) and may occur as far south as Madeira (see Türkay, 1976); Mediterranean records are listed by Zariquiey Alvarez (1968).

Very brief accounts of the first zoea of this species were given by Lebour (1928, 1931) and the second stage zoea described by Rice & Williamson (1977, fig. 22 e-f) as '*Bathynectes* sp. *B.*' may be that of *B. longipes*, otherwise the larval development has not been described and the complete larval morphology of only one other species of *Bathynectes* is known at present. Roberts (1969) described five zoeal stages attributed to *B. superba*. The female from which these larvae were obtained was collected off the Virginia coast, USA and more correctly belonged to *B. longispina* Stimpson, 1871, a species represented on the American Atlantic seaboard, whereas *B. superba* (Costa) is a synonym of *B. maravigna* (Prestandrea, 1839) (see Manning & Holthius, 1981) and is confined to the eastern Atlantic and Mediterranean.

In May 1984 a living ovigerous *B. longipes*, collected from the coast of Co. Donegal, was presented to this Museum by D. W. Connor of the Ulster Museum. The crab was maintained in the larval rearing laboratory of the BM (NH) and the larvae that hatched were successfully reared to megalopa stage. They provide material for the first complete account of the larval development of this species and have enabled comparisons to be made with the described stages of *B. longispina* and with the larvae of seven *Liocarcinus* species.

Materials and methods

The ovigerous crab was collected on 7 May 1984 in a depth not exceeding 20 m, from beneath boulders on limestone ridges at Bullockmore, St John's Point, Co. Donegal, Ireland. Rearing was carried out in temperatures of 16–18°C. The eggs hatched on 3–4. 6. 1984 and the first megalopas appeared on 24.7.1984. Drawings were made through a camera lucida attachment on an Olympus BH2 microscope and from preparations mounted in polyvinyl lactophenol. Measurements are as follows: T.T. = total length of zoea, measured between tips of dorsal and rostral spines; C.L. = carapace length, measured from between eyes to postero-lateral carapace margins for zoeas and from rostral tip to median posterior margin of carapace for the megalopas. Proportional measurements given in Table 2 are expressed as ratios of averaged measurements of a minimum of five specimens of each stage (except for *L. arcuatus* and *L. marmoreus* where sufficient material was not available). Telson fork lengths were measured from the bases of the lateral and dorsal spines respectively, to the fork tip. The base of the antennal spinous process was determined at a line drawn across the articulation of the endopod. All material was initially fixed and stored in the preservative formulated by Steedman (1976 : 148) and later transferred to 70% ethanol alcohol.

The female and reared material are deposited in the Collections of the Zoology Department, British Museum (Natural History), registration number: 1984 : 336.

Descriptions

Bathynectes longipes (Risso, 1816)

Bathynectes longipes: Lebour, 1928 : 515, Pl.IV, fig. 7; 1931 : 93, Pl.I, fig. 1 (coloured), 1st zoea.

FIRST ZOEAE

Dimensions: T.T. 1.50 mm, C.L. 0.40 mm.

Carapace (Fig. 1a, 6a): Dorsal spine stout and curved backwards; rostral spine stout proximally and acute distally, longer than antennae; lateral spines very long; dorso-median process prominent and without setules, a pair of postero-median setules present; postero-lateral margin of carapace without setules.

Eyes: Partly fused to carapace.

Antennule (Fig. 3a): Unsegmented, with 3 terminal aesthetascs and one seta.

Antenna (Fig. 3f): Spinous process long, about $2\frac{3}{4} \times$ exopod length, distal $\frac{1}{2}$ with numerous spinules; exopod with 2 terminal setules, one short seta and one long seta reaching into distal $\frac{1}{3}$ rd of spinous process.

Mandible (not figured): Incisor and molar processes developed, palp absent.

Maxillule (Fig. 4b): Endopod 2-segmented, with 1, 6 setae; basal endite with 5 spines; coxal endite with 7 spines/setae.

Maxilla (Fig. 4g): Endopod with lobes almost equally developed bearing 5 and 3 setae respectively; basal endite with pronounced outer and less prominent inner lobe bearing 4 and 5 setae respectively; coxal endite with broad outer and narrower inner lobe bearing 4 and 3 setae respectively; scaphognathite with 4 marginal plumose setae and a stout posterior plumose process.

First maxilliped (Fig. 5f): Basis with 10 setae arranged 2, 2, 3, 3,; endopod 5-segmented, with 2, 2, 1, 2, 4 + 1 setae; exopod incipiently segmented, with 4 terminal plumose setae.

Second maxilliped (Fig. 5g): Basis with 4 setae; endopod 3-segmented, with 1, 1, 4 + 1 setae, exopod with 4 terminal plumose setae.

Third maxilliped: Not developed.

Pereiopods: Not developed.

Abdomen (Figs 2a, b, g, 3k): with 5 segments + telson, 2nd with a pair of forwardly directed dorso-lateral processes, 3rd with a smaller pair of backwardly directed dorso-lateral processes. Postero-lateral margins of segments sub-oval, 2-5 with minute spinules. A pair of small setules near postero-dorsal margins of segments 2-5. Telson forks stout, slightly diverging posteriorly, proximally very minutely spinulate, each with one long and one shorter lateral spine and a dorsal spine; each half of telson posterior margin with 3 setae, median part concave.

SECOND ZOEAE

Dimensions: T.T. 1.60 mm, C.L. 0.60 mm.

Carapace (Fig. 1b): Lateral spines shorter than in first zoea; dorso-median process with 2 pairs of setules; postero-lateral margin with 2-3 long setules inserted near margin.

Eyes: Now stalked.

Antennule (Fig. 3b): With 5 terminal aesthetascs and one seta.

Antenna (Fig. 3g): Second longest of the apical setae on exopod now slightly shorter than in first zoea, antenna otherwise unchanged.

Mandible (not figured): Unchanged.

Maxillule (Fig. 4c): Basal endite with 7 spines/setae; coxal endite unchanged; outer margin of basis with prominent plumose seta.

Maxilla (Fig. 4h): Endopod, basal and coxal setation unchanged; scaphognathite with 10 marginal plumose setae.

First maxilliped (not figured): Basal and endopod setation unchanged; exopod with 6 terminal plumose setae.

Second maxilliped (not figured): Basal and endopod setation unchanged; exopod with 6 terminal plumose setae.

Third maxilliped: Not developed.

Pereiopods: Just discernible as undifferentiated buds.

Abdomen (Figs 2c, h, 3l): Postero-lateral margins of segments 3-5 with small and acute processes and 2-3 spinules. Medial part of telson posterior margin with a pair of small setules.

THIRD ZOEAE

Dimensions: T.T. 2.30 mm, C.L. 0.75 mm.

Carapace (Fig. 1c): Dorso-median process with 3 pairs of setules; postero-lateral margin with 4-5 long setules.

Eyes: Unchanged.

Antennule (Fig. 3c): Unchanged except for seta that is much shorter than in second zoea.

Antenna (Fig. 3h): Exopod slightly longer (relative to spinous process) than in second zoea; endopod with an incipient bud.

Mandible (not figured): Unchanged.

Maxillule (Fig. 4d): Basal endite with 8–9 spines/setae; coxal endite unchanged.

Maxilla (Fig. 5a): Endopod setation unchanged; basal endite with 5 setae on outer lobe; coxal setation unchanged; scaphognathite with 17 long plumose setae.

First maxilliped (not figured): Basal and endopod setation unchanged; exopod with 8 terminal plumose setae.

Second maxilliped (Fig. 5h): Basal setation unchanged; distal segment of endopod with 5 + 1 setae; exopod with 8 terminal plumose setae.

Third maxilliped: Not developed.

Pereiopods: Undifferentiated buds slightly larger than in second zoea.

Abdomen (Figs 2d, i, 3 m): With 6 segments + telson; dorso-lateral processes on 3 smaller than in second zoea; postero-lateral margin of 3–5 with well developed and acute processes; a small median setule on dorsal surface of first segment; median pair of setae on posterior margin of telson longer than in second zoea.

FOURTH ZOEAE

Dimensions: T. T. 2.40 mm, C.L. 0.90 mm.

Carapace (Fig. 1d): Dorsal spine with 6–7 setules; postero-lateral margin with 5–6 long setules.

Eyes: Unchanged.

Antennule (Fig. 3d): With 6 aesthetascs.

Antenna (Fig. 3i): Longest terminal seta on exopod much longer (relative to spinous process) than in third zoea; endopod bud almost as long as exopod in some specimens.

Mandible (not figured): Teeth on incisor and molar processes differentiated.

Maxillule (Fig. 4e): Basal endite with 10 spines/setae; coxal endite with 8 spines/setae.

Maxilla (Fig. 5b, d): Endopod setation unchanged; basal endite with 6 setae on inner lobe; coxal setation unchanged; scaphognathite with 20 long plumose setae.

First maxilliped (not figured): Basal and endopod setation unchanged; exopod with 10–11 terminal plumose setae.

Second maxilliped (not figured): Basal and endopod setation unchanged; exopod with 10–11 terminal plumose setae.

Third maxilliped (not figured): Now represented as an incipient bud.

Pereiopods (Fig. 1d): Represented as well formed undifferentiated buds.

Abdomen (Figs 2e, j): Postero-lateral processes on segments 3–5 longer than in third zoea; dorsal surface of first segment with 2 setules; 3 median setae present on telson posterior margin; pleopod buds on segments 2–5.

FIFTH ZOEAE

Dimensions: T.T. 2.80 mm, C.L. 1.15 mm.

Carapace (Fig. 1e): Dorso-median region with 5 pairs of setules; dorsal spine shorter (relative to carapace width) than in fourth zoea and with 6–8 setules; postero-lateral margin with 8–9 long setules.

Eyes: Unchanged.

Antennule (Fig. 3e): Exopod with 7 terminal and 3 sub-terminal aesthetascs; endopod represented as a small bud.

Antenna (Fig. 3j): Distal margin of endopod with several minute spinules, shorter of the 2 setae now considerably reduce in length, only one setule now apparent; endopod but much longer than exopod.

Mandible (Fig. 4a): Palp represented as a short broad bud.

Maxillule (Fig. 4f): Basal endite with 15 spines/setae; coxal endite with 10 spines/setae.

Maxilla (Fig 5 c, e): Endopod setation unchanged; basal endite with 6–7 setae on outer and 7 on inner lobe respectively; coxa with 4 setae on each lobe; scaphognathite with 29 or 30 long plumose setae.

First maxilliped (not figured): Basal and endopod setation unchanged; exopod with 12 terminal plumose setae.

Second maxilliped (not figured): Basal and endopod setation unchanged; exopod with 12 terminal plumose setae.

Third maxilliped (not figured): Bud much longer than in fourth zoea.

Pereiopods (Fig. 1e): First pair differentiated as chelipeds, others still unsegmented.

Abdomen (Fig. 2 f, k): First segment with 3 dorsal setae; dorso-lateral process on 3 very small; dorsal surface of telson with a pair of setules, 3 median setae on posterior margin longer than in fourth zoea; pleopod buds on segments 2–5 almost equal to lengths of segments.

MEGALOPA

Dimensions: C.L. 2.03 mm.

Carapace (Figs 6b, c): Longer than broad, narrowing anteriorly; rostrum long, directed obliquely downward and converging strongly distally to acute apex; submedian lobes rounded and raised; each protogastric and mesogastric region with raised broad carina; each epibranchial region with a short faint carina; cardiac region broadly elevated.

Eyes: Large and suboval.

Antennule (Fig. 6e): Peduncle 3-segmented, segments 2 & 3 each with setae; exopod 4-segmented, segments 2–4 with 6, 4 and 3 aesthetascs respectively, segment 3 also with 2 setae and 4 with one sub-terminal and one terminal seta; endopod 2-segmented, distal segment with 5 + 1 setae.

Antenna (Fig. 6d): Peduncle 3-segmented, segment 1 with 4 setae, 2 and 3 each with 2 setae respectively; flagellum 8-segmented, with (from proximal to distal) 0, 0, 2, 0, 5, 1, 4 and 3 setae respectively.

Mandible (Fig. 6f): Molar and incisor portions not differentiated; mandibular palp large, 3-segmented, distal segment longest and with 12 setae.

Maxillule (Fig. 6g): Endopod unsegmented, with 3–4 setae; basal endite with 25–26 spines/setae; coxal endite with 11 spines/setae.

Maxilla (Fig. 6h): Endopod reduced to a sub-acute lobe; basal endite with 9 setae on outer and 8 on inner lobe respectively; coxal endite with 3 setae on outer and 7 on inner lobe respectively; scaphognathite with 49–50 plumose setae.

First maxilliped (Fig. 7a): Coxal and basal segments differentiated, with 10–11 and 24–25 setae respectively; endopod unsegmented, with 5–6 setae on distal margin; exopod 2-segmented, outer distal margin of proximal segment with 3 setae, distal segment with 5 terminal setae; epipod with 7 long setae.

Second maxilliped (Fig. 7b): Coxal and basal segments undifferentiated with 2–4 short setae; endopod, merus with 2 inner distal setae, carpus with one outer distal seta, propodus with 6 distal setae, dactylus with 4 spines and 5 setae. Exopod 2-segmented, distal segment with 5 long setae.

Third maxilliped (Fig. 7c): Basal and coxal segments undifferentiated, with 2 setae on internal margin. Endopod, ischium with 3 teeth on inner margin 17–18 setae near inner margin and 4 on outer surface, merus with 10–11 setae, carpus and propodus with 7 and 8 setae respectively, dactylus with 10–11 setae all arranged as shown in figure. Exopod 2-segmented, distal segment with 4 terminal setae; epipod (not shown) with 14 setae.

Pereiopods (Figs 7d, e, 8a–c): Chelipeds stout, setosed as shown in figs 7d and with a prominent ischial spine; propodal inner margin with 4 obtuse teeth; dactylar inner margin with 2–3 poorly developed teeth. Pereiopods 2–5 relatively stout, setosed as shown; coxa of 2–4 with a spine and lower propodal margin with 3 thin spines and 1–2 small setae, inner lower dactyl margin with 7 spines, upper inner dactyl margin of pereopod 2 with 5 spines, the 2nd–4th of which are very long (see inset to fig. 7e); dactyl of pereopod 3 with similar spines of more or less equal lengths (inset to fig. 8a); fifth pereopod (fig. 8c) shorter than pereopods 2–4, lower propodal margin with 2 prominent setae; dactylus slightly flattened, lower margin 4 spines/setae and with 3 long hook-shaped setae on apex.

Abdomen (Figs 7f, g, 8f–g): With 6 segments + telson. Postero-lateral margins of segments 2–4 truncate; setae on 1–6 arranged as shown in figs 7f, g. Telson slightly broader than long, dorsal surface with one pair of median setules, ventral surface with 2 pairs of median and one of laterally placed setules (fig. 7g). Five pairs of pleopods, distal segment of exopods with long plumose marginal setae numbering 18, 20, 19, 16 on pleopods 1–4 respectively; pleopod 5 (uropod) with 11 setae on distal segment and one on outer margin of proximal segment (fig. 8f). Endopods of pleopods 1–4 with 2, 3, 4 and 3 coupling hooks respectively on disto-internal margins.

Remarks

The zoeal stages of *Bathynectes longipes* differ in a number of features from those of *B. longispina* (described by Roberts, 1969 as *B. superba*). The first stage zoea of *B. longispina* apparently has 'long postero-lateral spines' on abdominal segments 3–5. This is a feature more typical of geryonid and xanthid first stage zoeae whereas this stage in all known polybiinid zoea has the postero-lateral margins of segments 3–5 hardly produced. *B. longispina* has also a high number

Table 1 Comparative features of zoeal stages of *Bathynectes longipes* and *B. longispina*

	<i>Bathynectes longipes</i> (Risso)	<i>Bathynectes longispina</i> Stimpson
ZOEA I		
Antennule, setae/aesthetascs:	4	6
Antenna, spinous process/ exopod:	much more than $\times 2$ length	slightly more than $\times 2$ length
Abdomen, postero-lateral margin of segments 3–5:	not produced as spinous processes	produced as spinous processes
Telson, width of anterior margin:	much less than telson length (measured to posterior margin)	equal to telson length (measured to posterior margin)
first lateral spine:	not extending to dorsal spine	extending to dorsal spine
ZOEA II		
Antenna, spinous process/ exopod:	much more than $\times 2$ length	slightly more than $\times 2$ length
Maxillule, spines/setae on basis:	7	9
Maxilla, setae on basal inner lobe:	4	5
Abdomen, postero-lateral margin of segments 3–5:	only slightly produced as spinous processes	well produced as spinous processes
Telson, width of anterior margin:	much less than telson length (measured to posterior margin)	slightly more than telson length (measured to posterior margin)
first lateral spine:	not extending to dorsal spine	extending to dorsal spine
ZOEA III		
Antenna, spinous process/ exopod:	more than $\times 2$ length	slightly more than $\times 2$ length
Maxillule, spines/setae on basis:	8–9	10
Maxilla, scaphognathite setae:	17	19
Second maxilliped, endopod distal segment:	5 + 1 setae	4 + 1 setae
Abdomen, postero-lateral margin of segments 3–5:	much shorter than segments	almost as long as segments
dorsal surface segt. 1:	1 seta	4 setae
Telson, width of anterior margin:	about $1\frac{1}{3} \times$ length (measured to posterior margin)	nearly $\times 2$ length (measured to posterior margin)
first lateral spine:	not extending to dorsal spine	extending to dorsal spine
ZOEA IV		
Antennule, setae/aesthetascs:	7	9
Maxillule, spines/setae on basis:	10	16
coxa:	8	9
Maxilla, setae on outer/inner lobes of basis:	5 + 6	7 + 7
scaphognathite:	20	27
Second maxilliped, endopod distal segment:	5 + 1 setae	4 + 1 setae
Abdomen, dorsal surface segt. 1:	2 setae	4 setae
Telson, width of anterior margin:	slightly exceeding telson length (measured to posterior margin)	nearly $\times 2$ telson length (measured to posterior margin)
first lateral spine:	not extending to dorsal spine	extending to dorsal spine
posterior margin:	3 setules	4 setules

Table 1 Continued

	<i>Bathynectes longipes</i> (Risso)	<i>Bathynectes longispina</i> Stimpson
ZOEA V		
Antennule, setae/aesthetascs:	10	14
Antenna, spinous process/ exopod:	more than $\times 2$ length	less than $\times 2$ length
Maxillule, spines/setae on basis:	15	19
coxa:	10	13
Maxilla, setae on outer/inner lobes of basis:	6-7+7	9+8
coxa:	4+4	5+5
scaphognathite:	29-30	42
Abdomen, dorsal surface segt. 1:	3 setae	4 setae
Telson, width of anterior margin:	slightly less than telson length (measured to posterior margin)	less than telson length (measured to posterior margin)
dorsal surface:	with a pair of setules	without setules
first lateral spine:	not extending beyond dorsal spine	extending beyond dorsal spine

of scaphognathite setae (42) in the fifth stage zoea. *B. longipes* has 29-30 in this stage and a similar number is found in the known fifth zoeal stages of *Liocarcinus* species, except for *L. marmoreus* which has 40 setae. Additional comparative features of *B. longipes* and *B. longispina* are given in Table 1. Collectively these indicate that there are greater differences between the zoeae of these two species of *Bathynectes* than between *B. longipes* and the *Liocarcinus* zoeae examined (see Table 2). Clark (1984) was unable to discover satisfactory meristic characters for distinguishing zoeae of *Liocarcinus* species at all stages and this present study has revealed a similar situation with respect to the zoeae of *B. longipes* and *Liocarcinus*. However, there appear to be a number of subtle differences separating zoeal stages of *B. longipes* from those of *Liocarcinus* species studied as well as fine distinctions between the zoeae of these *Liocarcinus* species themselves. These differences are expressed as combined characters in Table II. Recently it was possible to assign plankton collected *Liocarcinus* zoeae to either *L. puber* or *L. holsatus* using the combined features listed in this table. These larvae were collected in the Aran Islands region of Co. Galway where adults of both species are common (pers. comm. O. Tully, Univ. College, Galway). Further studies are needed to establish whether this Table, based on laboratory material, is satisfactory for identifying plankton caught specimens of other *Liocarcinus* species.

The megalopal stage of *B. longipes* has been compared with this stage of only five *Liocarcinus* species; megalopas of *L. marmoreus* were not available for study and this stage of *L. corrugatus* is still unknown. These comparisons are also listed in Table 2. The more important combined features that distinguish this stage of *B. longipes* are: (1) the setal formula on the antennal flagellum and uropods; (2) the number of spines on the dactyl lower margins of pereopods 2-4; (3) the broadly rounded postero-lateral margins of the telson. Additional, less significant features are also listed in the Table.

The zoeal stages of *B. longipes* and *Liocarcinus* thus all show considerable homogeneity and specific larval differences are recognisable only in the megalopal stage. This contrasts with the more apparent dissimilar morphology of the known young crab stages into which these respective species metamorphose (see Ingle & Rice, 1984) and the very clear specific differences of the adults (see Ingle, 1980). Indeed, within the genus *Liocarcinus* it is possible to recognise at least six 'species-groups' on adult features, viz: (i) *L. puber*; (ii) *L. holsatus*, *L. marmoreus*; (iii) *L. pusillus*, *L. maculatus*, *L. zariqueiyi*; (iv) *L. corrugatus*; (v) *L. depurator*, *L. bolivari*; (vi) *L. arcuatus*. The larval morphology of this genus is still incompletely known and the available larval

Table 2 Comparative larval features of *Bathynectes longipes* and seven *Liocarcinus* species. Abbreviations: < = not extending into; ~ = extending as far as; > = just extending into; > + = extending well into. 1 from Clark (1984); 2 from Rice & Ingle, 1975; 3 from Rice & Ingle, 1978; 4 from Goldstein, 1971. For measurement details see Material and methods

Feature	<i>B. longipes</i>	<i>L. puber</i>	<i>L. holsatus</i>	<i>L. marmoreus</i>	<i>L. pusillus</i>	<i>L. corrugatus</i>	<i>L. arcuatus</i>	<i>L. depurator</i>
ZOEA I								
T.T:	1.50	1.9-2.2 ²	1.1-1.3 ²	1.18-1.24 ²	1.90-2.20 ²	1.55	0.95	1.52
Antennule, aesthetascs + setae:	4	4 ¹	5 ¹	6 ¹	5 ¹	4 ¹	6 ¹	7 ¹
Antenna, exopod length/spinuous process:	2.61	3.00	2.50	2.50	2.18	2.35	2.25	2.40
Antenna exopod innermost seta/ distal $\frac{1}{3}$ spinous process:	>	>	~	~	~	~	>	~
Maxilla, endopod setation for all stages:	5+3	usually ¹ 4+3	5+3	5+3	5+3	5+3	5+3	5+3
Telson, fork length/outermost lateral spine:	3.88	6.25	4.25	4.57	3.87	3.88	5.50	5.00
Telson, fork length/dorsal spine:	4.50	5.00	3.71	3.71	3.71	5.60	6.50	4.50
ZOEA II								
T.T:	1.60	2.2-2.5 ²	1.40-1.60 ²	1.40 ²	1.43-1.58 ³	1.65	1.12	1.65
Antennule, aesthetascs + setae:	6	4 ¹	5 ¹	5 ¹	5 ¹	7 ¹	8 ¹	7 ¹
Antenna, exopod length/spinuous process:	2.66	2.84	2.50	3.10 ⁴	2.33	2.36	3.71	3.35
Antenna, exopod innermost seta/ distal $\frac{1}{3}$ spinous process:	>	<	~	~ ⁴	<	>	>	<
Maxilla, scaphognathite setae:	10	9 ¹	9 ¹	11 ¹	9 ¹	10 ¹	9 ¹	9 ¹
Telson, fork length/outermost lateral spine:	4.70	6.80	4.04	5.16 ⁴	4.30	4.92	4.26	5.00
Telson, fork length/dorsal spine:	5.50	8.66	4.70	4.40 ⁴	4.28	5.60	6.86	5.00
ZOEA III								
T.T:	2.30	3.0-3.3 ²	1.90-2.20 ²	1.70 ²	1.66-1.76 ²	2.0	1.40	2.02
Antennule, aesthetascs + setae:	6	6 ¹	6 ¹	5 ¹	6 ¹	7 ¹	8 ¹	5 ¹
Antenna, exopod length/spinuous process:	2.60	2.33	2.67	2.90 ⁴	2.51	2.35	3.58	2.98
Antenna exopod innermost seta/ distal $\frac{1}{3}$ spinous process:	>	<	<	<	<	>	<	~
Maxilla, scaphognathite setae:	17	17 ¹	17 ¹	13 ¹	15 ¹	17 ¹	15 ¹	18 ¹
Telson, fork length/outermost lateral spine:	4.73	6.60	4.53	4.50 ⁴	4.30	5.07	3.95	4.62
Telson, fork length/dorsal spine:	6.60	6.56	5.76	5.20	4.28	6.17	4.53	5.14
Abdominal segment 3, lateral processes:	+	-	-	—	+	+	+	+
ZOEA IV								
T.T:	2.40	3.40-3.60 ²	2.60-2.90 ²	2.0 ²	2.11-2.25 ²	2.55	1.95	2.50
Antennule, aesthetascs + setae:	6	9 ¹	7 ¹	7 ¹	7 ¹	7 ¹	8 ¹	5 ¹
Antenna, exopod length/spinuous process:	2.60	2.08	2.64	2.56 ⁴	2.52	2.33	3.46	2.90
Antenna exopod innermost seta/ distal $\frac{1}{3}$ spinous process:	> +	> +	<	<	<	> +	<	> +
Maxilla, scaphognathite setae:	20	22 ¹	26 ¹	26 ¹	22 ¹	23 ¹	22 ¹	27 ¹
Telson, fork length/outermost lateral spine:	5.00	6.50	4.41	6.30 ⁴	5.50	6.37	5.41	5.80
Telson, fork length/dorsal spine:	7.70	5.88	4.11	3.3 ⁴	4.45	6.50	5.14	6.04
Abdominal segment 3, lateral processes:	+	-	-	—	-	+	-	+

Table 2 Continued

Feature	<i>B. longipes</i>	<i>L. puber</i>	<i>L. holsatus</i>	<i>L. marmoreus</i>	<i>L. pusillus</i>	<i>L. corrugatus</i>	<i>L. arcuatus</i>	<i>L. depurator</i>
ZOEAE V								
T.T:	2.80	3.8-4.1 ²	3.00-3.50 ²	3.70 ²	2.54-2.78 ²	2.90	2.45	2.80
Antennule, aesthetascs + setae:	11	17 ¹	15 ¹	14 ¹	11 ¹	11 ¹	12 ¹	13 ¹
Antenna, exopod length/spinous process:	2.50	1.93	2.61	2.42	2.50	2.05	2.58	2.38
Antenna exopod innermost seta/ distal $\frac{1}{3}$ spinous process:	> +	> +	<	<	<	> +	<	> +
Maxilla, scaphognathite setae:	29-30	32 ¹	31 ¹	40 ¹	32 ¹	28 ¹	31 ¹	32 ¹
Telson, fork length/outermost lateral spine:	5.00	5.40	5.39	5.10 ⁴	5.50	7.45	6.04	6.01
Telson, fork length/dorsal spine:	7.70	7.12	4.11	3.60 ⁴	5.31	7.89	5.26	6.30
Abdominal segment 3, lateral processes:	+	-	-	—	-	+	-	+
MEGALOPA								
C.L:	2.03	1.66-2.09 ²	1.86-2.16 ²	2.0 ²	1.67-1.93 ²	—	1.25	2.01
Antennal flagellum, segmt. no:	8	7	8	6 ⁴	7	—	8	8
Antennal setation of segmts:	0,0,2,0, 5,1,4,3	0,0,4,0, 4,4,4	0,0,2,0, 5,1,2,3	0,4,5, 4,4,4 ⁴	0,3,0,4, 0,4,3	—	0,0,2,0, 4,0,3,5	0,0,4,0, 4,1,3,4
Pereiopods 2-4, spines on dactyl lower margin:	7,7,7	5,5,4	6,7,5	—	5,5,5	—	4,4,2	7,8,8
Pereiopods 2-3, stout spines on dactyl inner upper margin:	5,5	5,5	4,4	—	3,3	—	3,4	3,4
Pleopods 1-4, exopod setae:	18,20,19, 16	17-19,16- 19,17-18, 13-15	17-20,19- 20,18-19, 14-16	16 ⁴ —	14-17,14-16, 13-15,12-14	—	17,16,14 12	19,18,18 15
Uropod, exopod setae:	11	8-10	9-10	8 ⁴	7-8	—	7-8	8-10
Telson, lateral setae:	+	+	-	—	-	—	-	+
Telson, postero-lateral margins:	broadly rounded	subacute	subacute	—	subacute	—	subacute	subacute

evidence does not provide convincing support for these suggested species-groups. Rice (1981) however, has suggested that zoeal similarities could be the result of evolutionary convergence and the zoeal congruences demonstrated here may be examples of such convergence, particularly as the zoeal stages of polybiinids appear to show considerable plasticity in their morphology in the reduction or loss of spines and in exhibiting variations in setal numbers during their individual development.

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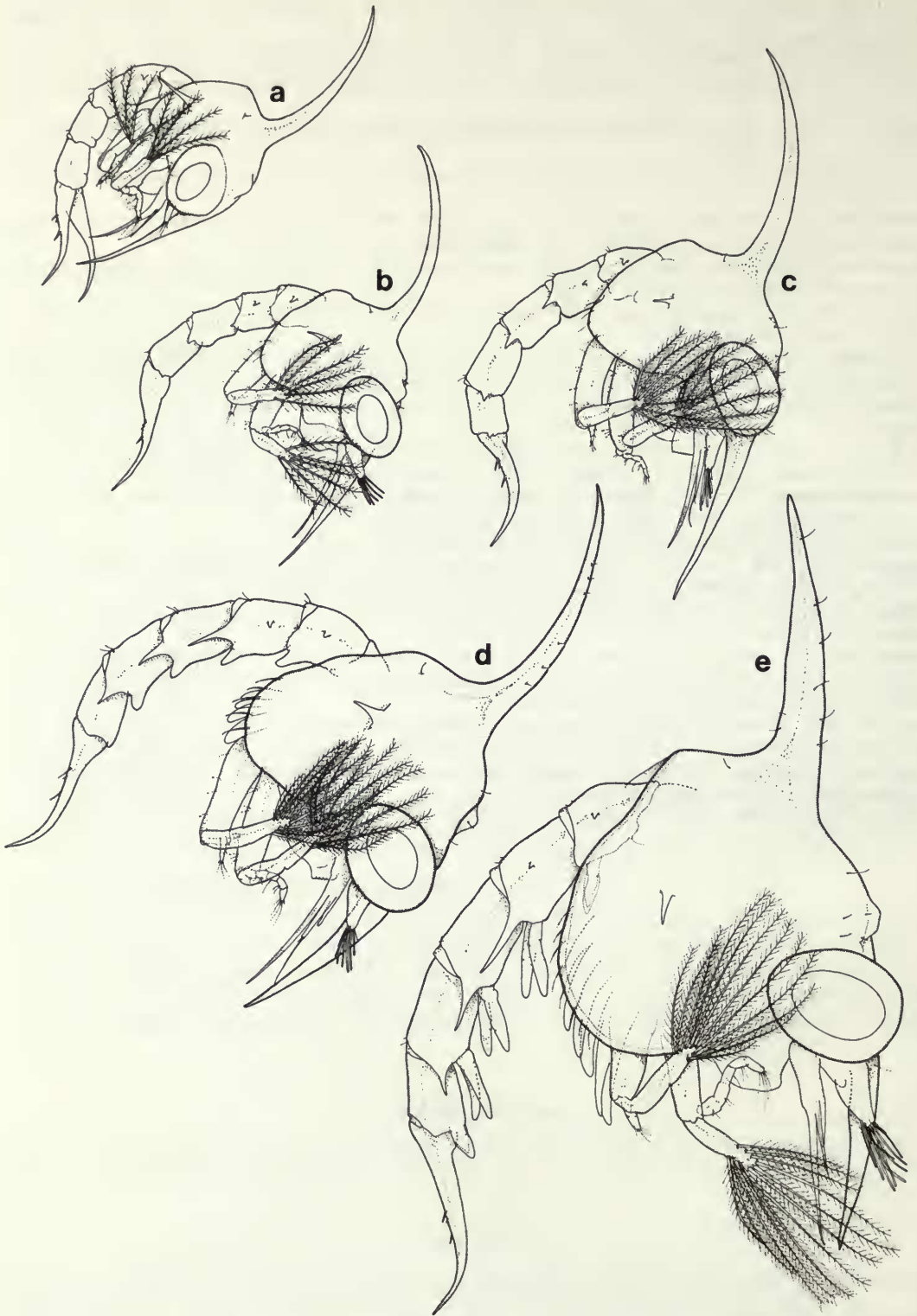


Fig. 1 *Bathynectes longipes* (Risso): a-e, zoeae I-V lateral aspects.

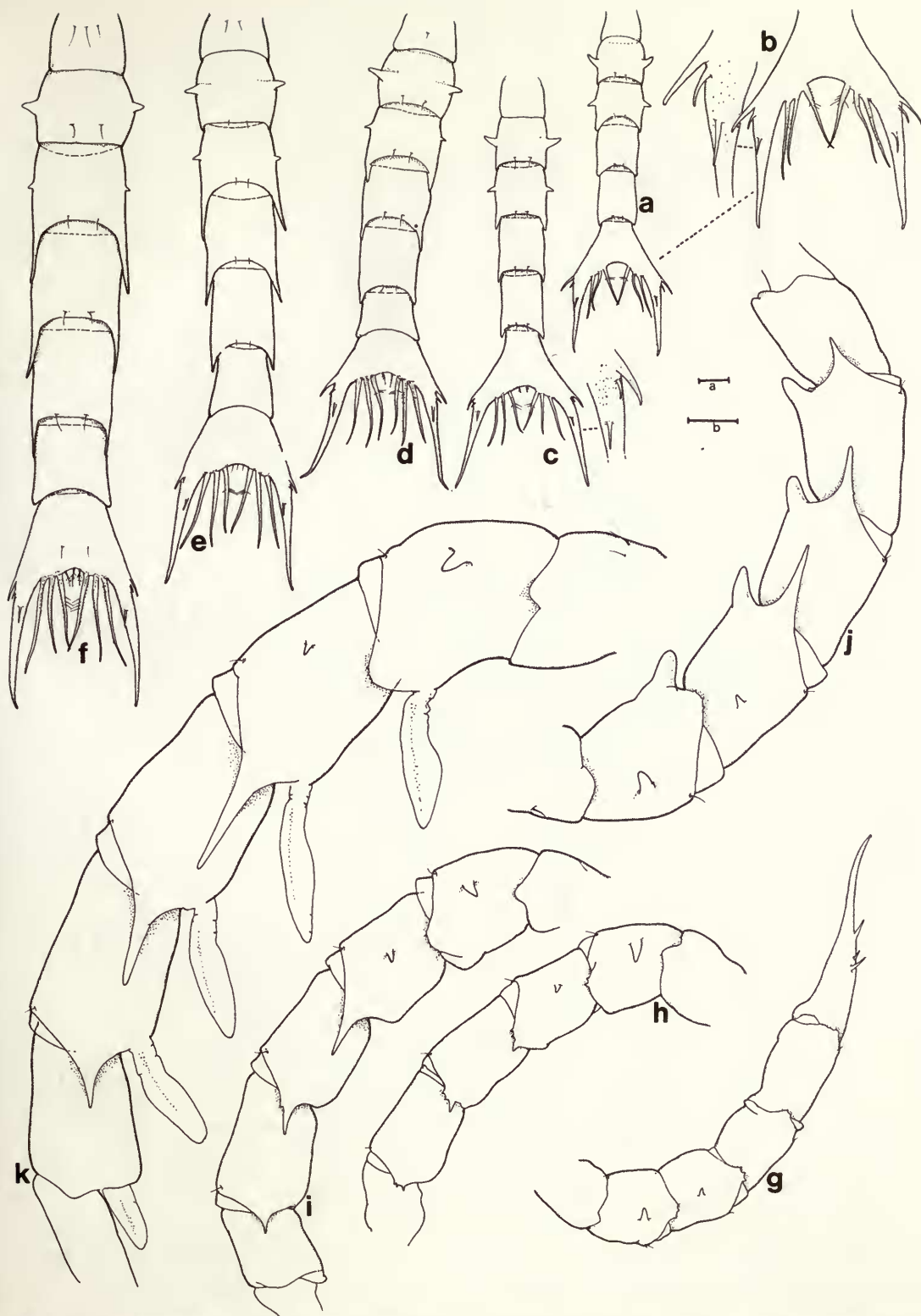


Fig. 2 *Bathynectes longipes* (Risso): abdomen, a-f dorsal and g-k lateral aspects of zoeae I-V. Scales = 0.1 mm; a, c-f to scale a; b, g-k to b.

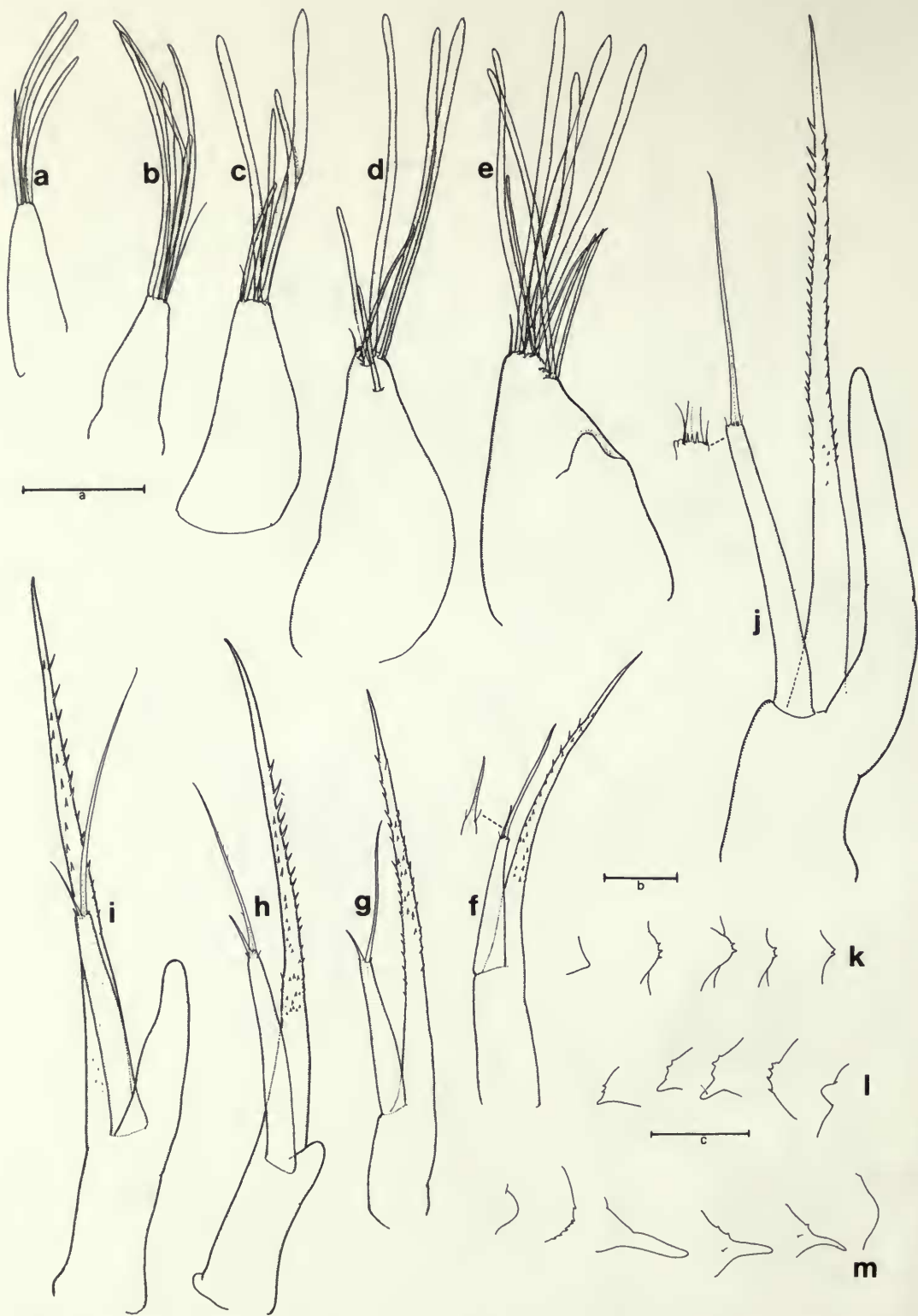


Fig. 3 *Bathynectes longipes* (Risso): a-e antennule, f-j antenna of zoeae I-V; k-m lateral processes of abdominal segments of zoeae I-III. Scale=0.1 mm; a-j scale a; k to b; l, m to c; insets to c.

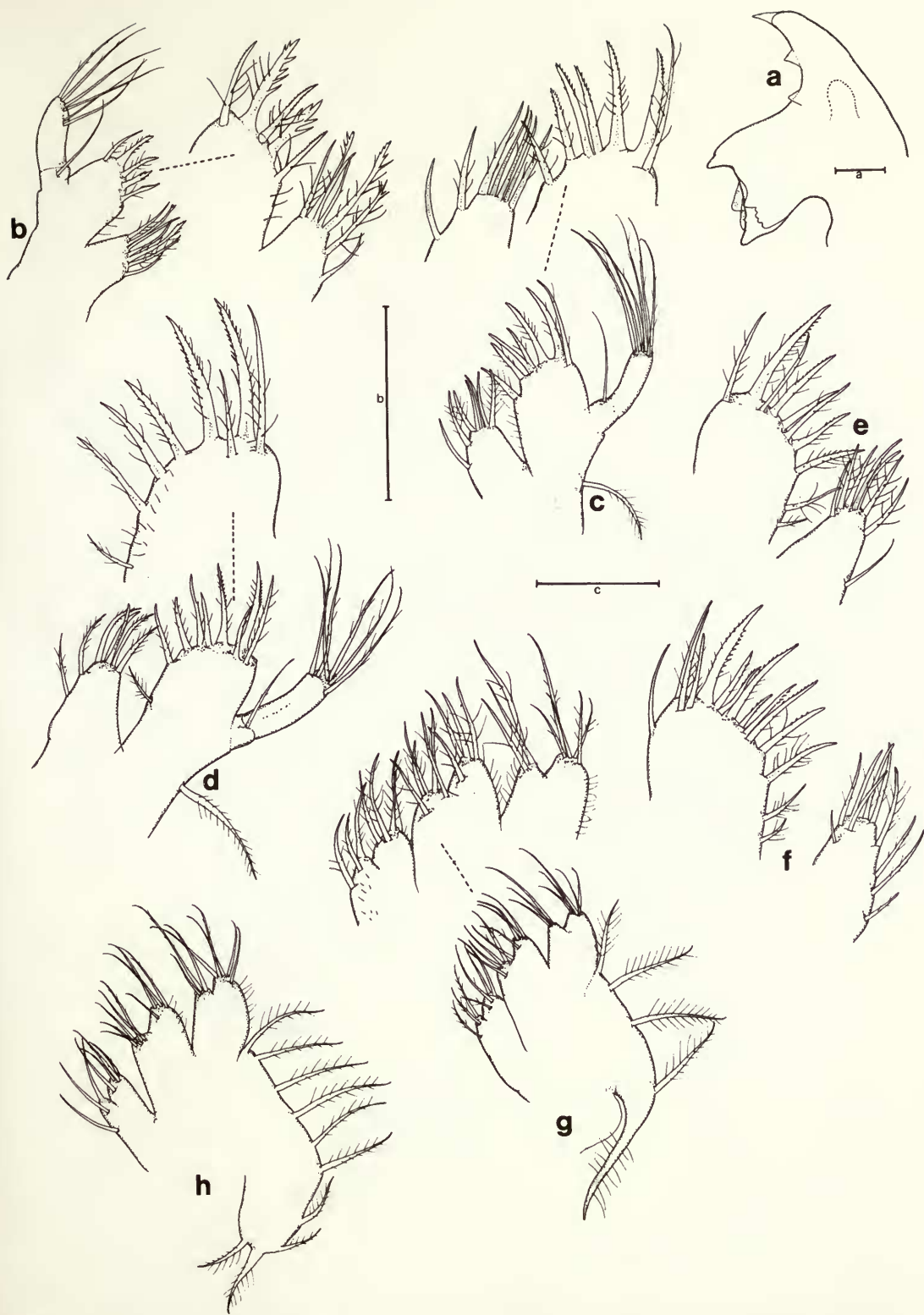


Fig. 4 *Bathynectes longipes* (Risso): a mandible of zoea V; b-f maxillule of zoeae I-V; g-h maxilla of zoeae I-II. Scale = 0.1 mm; a to scale a; b-h to c; insets to b (inset of d depicts a different specimen).



Fig. 5 *Bathynectes longipes* (Risso): a maxilla of zoea III; b maxilla basis and coxa of zoea IV; c maxilla basis and coxa of zoea V; d-e maxilla scaphognathite of zoeae IV and V; f-g first and second maxillipeds of zoeae I-II; h second maxilliped, distal endopod segment of zoea III. Scale = 0.1 mm; a, d, e, h, to scale b; b, c and inset to a; f, g to c.

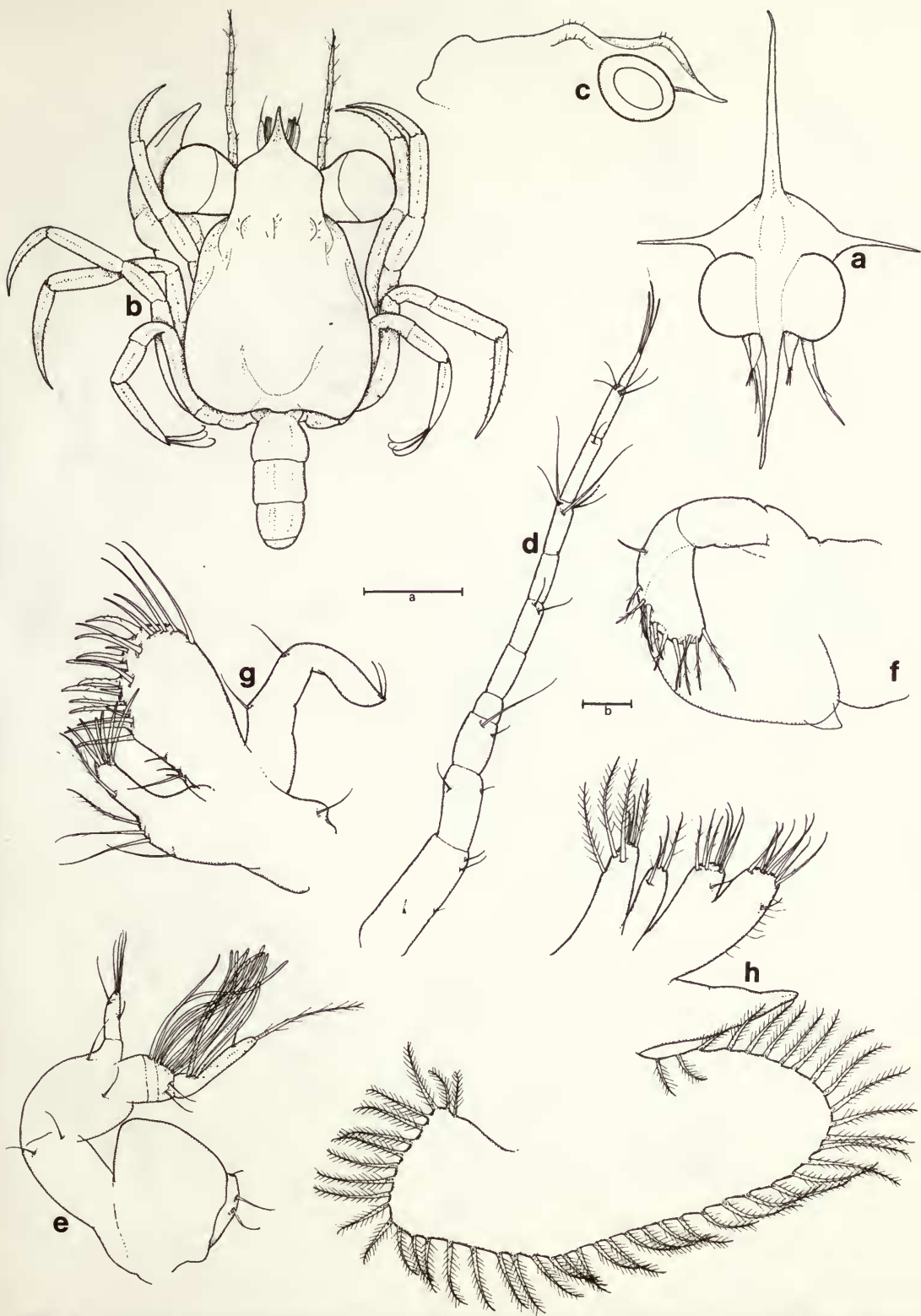


Fig. 6 *Bathynectes longipes* (Risso): a frontal aspect of zoeae I. Megalopa, b-c dorsal and lateral aspects of carapace (limb segments foreshortened); d antenna; e antennule; f mandible; g maxillule; h maxilla. Scale = 0.1 mm; f, g, h to scale a; d to b.

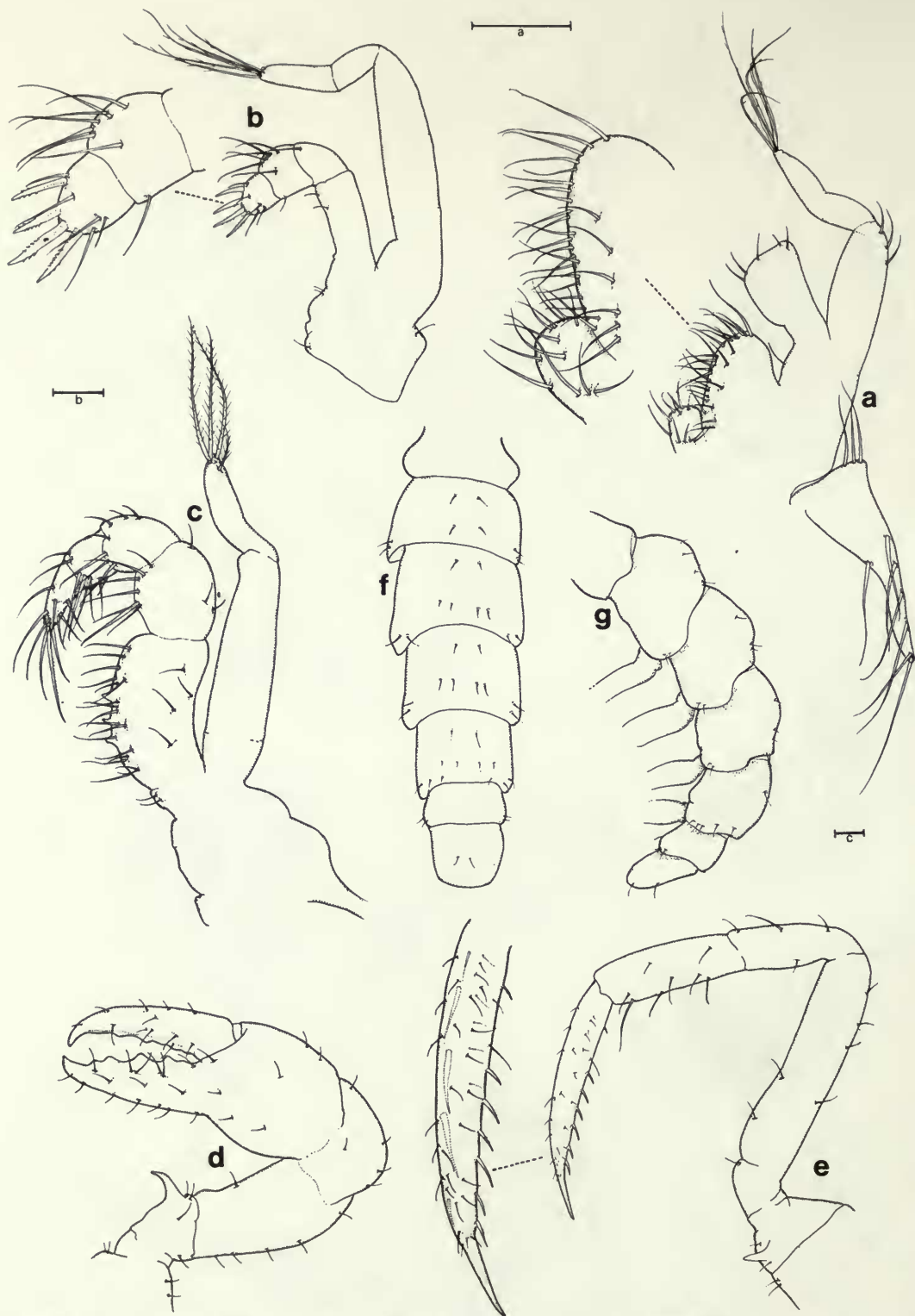


Fig. 7 *Bathynectes longipes* (Risso): megalopa, a-c first to third maxilliped; d left cheliped; e second pereiopod; f-g abdomen from dorsal and lateral aspects. Scale = 0.1 mm; a-c, e to scale b; d, f, g to c; insets to a.

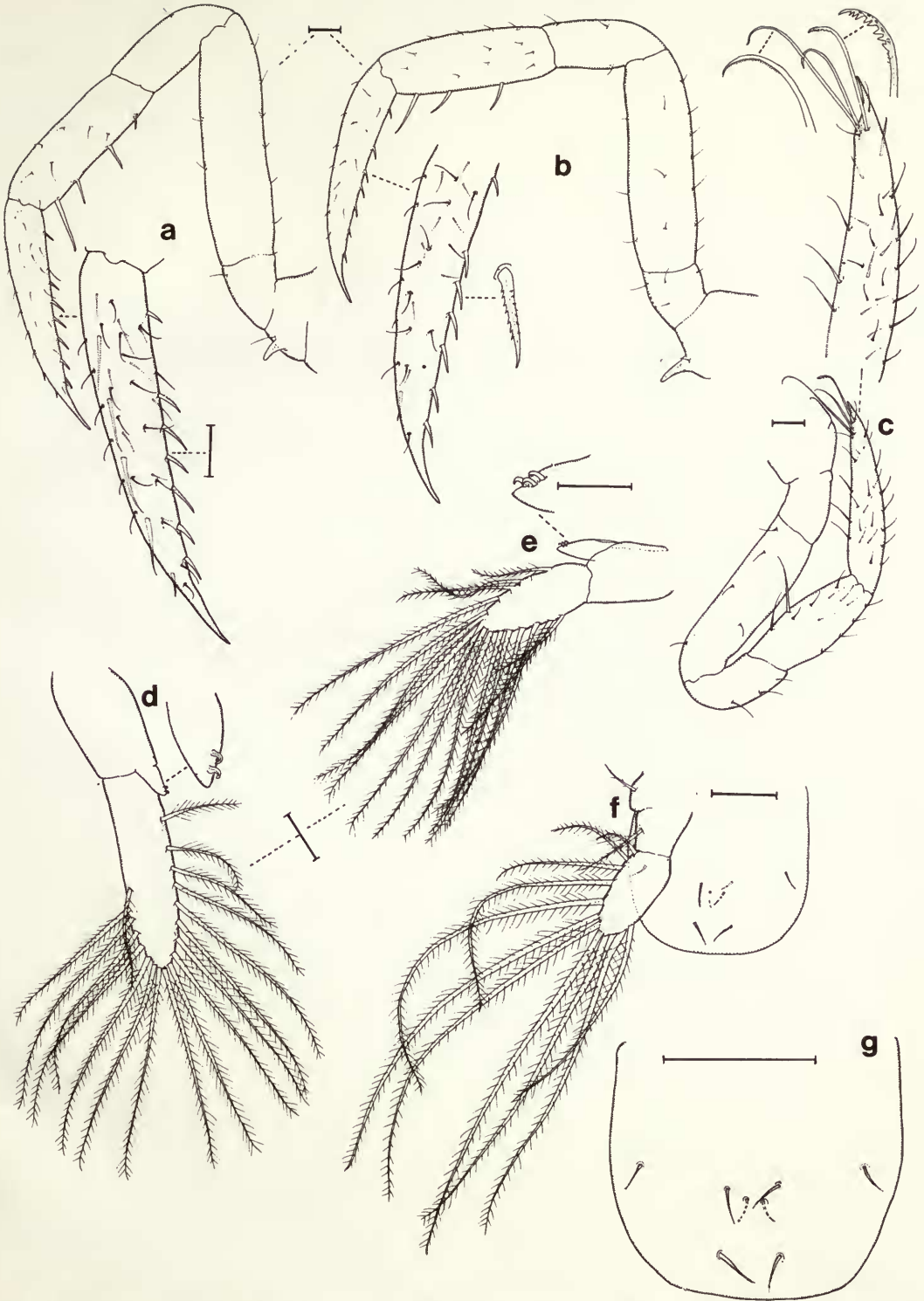


Fig. 8 *Bathynectes longipes* (Risso): megalopa, a-c third to fifth pereiopod; d-e first and fourth pleopod; f right uropod and telson from ventral aspects; g telson from ventral aspect. Scale = 0.1 mm.